Date: October 28, 2009

Lesson Title: 3.4 Linear Equations & the Intercept Form

Objective

- Write a linear equation in intercept form (given a recursion routine, a graph, or data).
- Explain the meaning of y-intercept and coefficient for a linear equation in intercept form.

IN

Inner / Outer Circle (5-7 minutes)

Aug 26-9:45 AM

Inner/Outer Circle:

- What is an Inner/Outer Circle?
- Example of an Inner/Outer Circle.
- How to arrange desks for the Inner/Outer Circle.
- Questions?

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Inner/Outer Circle Questions:

- What is a recursive routine?
- What is a scatter plot?
- How does a recursive routine relate to a graph?
- How are a table and graph related?
- When you analyze the walker graph, how do you know the starting value, the walkers direction and the rule (speed) of the walk?

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Working Out with Equations investigation (25 minutes)

Manisha starts her exercise routine by jogging to the gym. Her trainer says this activity burns 215 calories. Her workout at the gym is to pedal a stationary bike. This activity burns 3.8 calories per minute.

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First you'll model this scenario with your calculator.

Step 1:

Use calculator lists to write a recursive routine to find the total number of calories Manisha has burned after each minute she pedals the bike. Include the 215 calories she burned on her jog to the gym.

Manisha's Workout

Pedaling time (min) x	Total calories burned y
0	215
1	
2	
20	
30	
45	
60	

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Step 2:

Copy and complete the table using your recursive routine.

Step 3:

After 20 minutes of pedaling, how many calories has Manisha burned? How long did it take her to burn 443 total calories?

Manisha's Workout

Pedaling time (min) x	Total calories burned y
0	215
1	
2	
20	
30	
45	
60	

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Next you'll learn to write an equation that gives the same values as the calculator routines

Step 4:

Write an expression to find the total calories Manisha has burned after 20 minutes of pedaling. Check that your expression equals the value in the table.

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Step 5:

Write and evaluate an expression to find the total calories Manisha has burned after pedaling 38 minutes. What are the advantages of this expression over a recursive routine?

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Step 6:

Let x represent the pedaling time in minutes, and let y represent the total number of calories Manisha burns. Write an equation relating time to total calories burned.

Step 7:

Check that your equation produces the corresponding values in the table.

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Now you'll explore the connections between the linear equation and its graph.

Step 8:

Plot the points from your table on your calculator. Then enter your equation into the Y = menu. Graph your equation to check that it passes through the points. Give two reasons why drawing a line through the points realistically models this

Oct 12-5:52 PM

Now you'll explore the connections between the linear equation and its graph.

Step 9:

Substitute 538 for y in your equation to find the elapsed time required for Manisha to burn a total of 538 calories. Explain your solution process. Check your result.

Step 10:

How do the starting value and the rule of your recursive routine show up in your equation? How do the starting value and the rule of your recursive routine show up in your graph? When is the starting value of the recursive routine also the value where the graph crosses the y-axis?

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The equation for Manisha's workout shows a linear relationship between the total calories burned and the number of minutes pedaling on the bike. You probably wrote this linear equation as

$y = 215 + 3.8x$ or $y = 3.8x + 215$

The form $y = a + bx$ is the **intercept form.** The value of a is the **y-intercept,** which is the value of y when x is zero. The intercept gives the location where the graph crosses the y-axis. The number multiplied by x is b, which is called the **coefficient** of x.

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Example A:

Suppose Sam has already burned 325 calories before he begins to swim for his workout. His swim will burn 7.8 calories per minute.

a. Create a table of values for the calories Sam will burn by swimming 60 minutes and the total calories he will burn after each minute of swimming.

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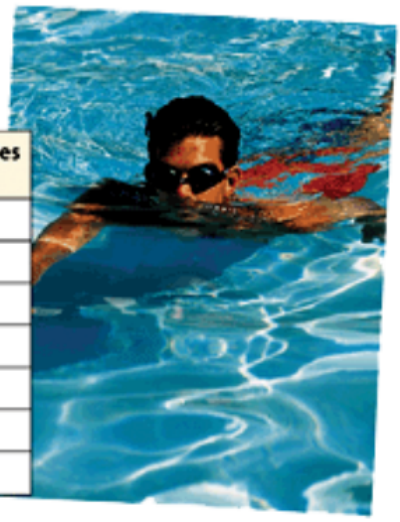
Example A solution:

a. The total numbers of calories burned appear in the third column of the table. Each entry is 325 plus the corresponding entry in the middle column.



Sam's Swim

Swimming time (min)	Calories burned by swimming	Total calories burned
0	0	325
1	7.8	332.8
2	15.6	340.6
20	156	481
30	234	559
45	351	676
60	468	793

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Example A:

Suppose Sam has already burned 325 calories before he begins to swim for his workout. His swim will burn 7.8 calories per minute.

b. Define variables and write an equation in intercept form to describe this relationship.

c. On the same set of axes, graph the equation for total calories burned and the direct variation equation for calories burned by swimming.

d. How are the graphs similar? How are they different?

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Example A solution:

b. Let y represent the total number of calories burned, and let x represent the number of minutes Sam spends swimming.

$$y = 325 + 7.8x$$

c. The direct variation equation is $y = 7.8x$. Enter it into Y1 on your calculator. Enter the equation $y = 325 + 7.8x$ into Y2. Check to see that these equations give the same values as the table by looking at the calculator table.

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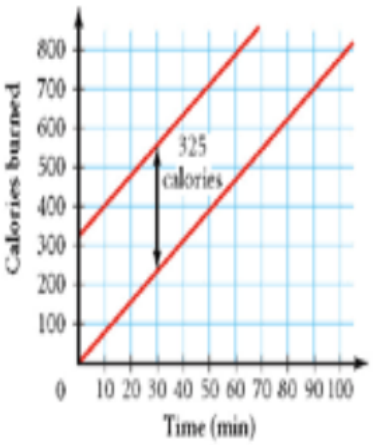
Example A solution:

d. The lower line shows the calories burned by swimming and is a direct variation. The upper line shows the total calories burned. It is 325 units above the first line because, at any particular time, Sam has burned 325 more calories. Both graphs have the same value of b, which is 7.8 calories per minute. The graphs are similar because both are lines with the same steepness. They are different because they have different y-intercepts.



What will different values of a in the equation $y = a + bx$ do to the graph?

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Topic Posters: (5 minutes)

What do you know?

What do you have questions about?

On a Post-it-note:

Please write a response about how you feel about the topic; the response should indicate your level of understanding about the topic.

Aug 26-9:45 AM

Summary:

The equation y = a + bx is called _____, since the value of .....

Out:

I have a test Thursday/Friday, so I will review 3.1-3.4

I will look on the Wiki under the Review section to find helpful study hints located there.

Aug 26-9:45 AM

End of Class - Have a Great Day!!!

Oct 14-9:06 AM